METHOD AND APPARATUS FOR TRIGGERING HANDOVER BETWEEN ACCESS POINTS BASED ON GATHERED HISTORY DATA OF SERIES OF ACCESS POINTS

TECHNICAL FIELD

[0001] The present invention relates generally to mobile communication system. The invention relates particularly, though not exclusively, to triggering a handover between access points.

BACKGROUND ART

[0002] Today's mobile apparatuses provide wide variety of services using plurality of radio networks. Typically, users of the mobile apparatuses use the services in various circumstances, also when moving around. When moving around using the mobile apparatus with an active service requiring a data connection to a radio network, a problem of a limited radio signal operating range may exist.

[0003] Achieving disruption free connectivity with radio technologies that are not designed for mobility may be troublesome. For example, non-cellular radio technologies such as Wi-Fi may not have a centralized radio network controller to provide handovers between access points. For example walking ten meters may change Wi-Fi reception from excellent to very poor. Handovers are normally done based on signal strength but Wi-Fi reception changes too rapidly and unexpectedly to allow this. For example, walking with an ongoing Skype (IP) call with a Wi-Fi connection is very risky as the call might be dropped at any time. This problem is especially difficult in cases where the handover is not performed between two commonly managed Wi-Fi access points.

SUMMARY

[0004] According to a first example aspect of the invention there is provided a method comprising:

[0005] receiving wireless communication service from a first access point;

[0006] detecting a change in fingerprint data relating to available access points;

[0007] correlating recent history data of a series of fingerprint data with history data comprised by a history database;

[0008] determining, in response to the correlation and by using the fingerprint data and the history data, a second access point; and

[0009] triggering a handover from the first access point to the second access point.

[0010] In an embodiment, the method may further comprise:

[0011] estimating a route of a user by correlating at least two most recent fingerprint data of the history data with the series of fingerprint data reflecting earlier movement of the user; and

[0012] determining, using the fingerprint data and the estimated route, the second access point.

[0013] In an embodiment, the method may further comprise:

[0014] determining, using the fingerprint data and the history data, the second access point being unavailable; and

[0015] notifying a user of an apparatus before disconnection of the wireless communication service from the first access point.

[0016] In an embodiment, any of the access points comprises at least one of the following:

[0017] a wireless local area network (WLAN) access point;

[0018] a Bluetooth access point;

[0019] an ultra-wideband access point; and

[0020] a cellular network base station.

[0021] In an embodiment, the method may further comprise:

[0022] maintaining the fingerprint data in a fingerprint database; and

[0023] maintaining the history data in the history database.

[0024] In an embodiment, the fingerprint database may be located in at least one of the following:

[0025] a user apparatus; and

[0026] a server apparatus.

[0027] In an embodiment, the history database may be located in at least one of the following:

[0028] a user apparatus; and

[0029] a server apparatus.

[0030] According to a second example aspect of the invention there is provided a method comprising:

[0031] determining fingerprint data relating to available access points;

[0032] comparing the fingerprint data to known fingerprint data of a fingerprint database;

[0033] updating the fingerprint database in response to the comparison revealing new fingerprint data; and

[0034] storing history data of series of fingerprint data reflecting earlier movement of a user to a history database.

[0035] In an embodiment, the method may further comprise:

[0036] determining the fingerprint data relating to available access points using sensors of an apparatus; and

[0037] storing the fingerprint data to the history data of a series of fingerprint data.

[0038] In an embodiment, the method may further comprise:

[0039] determining the fingerprint data relating to available access points using sensors of an apparatus;

[0040] transmitting the fingerprint data to a crowdsourcing server;

[0041] updating the fingerprint data to a crowdsourcing fingerprint database at the crowdsourcing server; and

[0042] receiving, at the apparatus, fingerprint data comprising at least part of the crowdsourcing fingerprint database.

[0043] According to a third example aspect of the invention there is provided an apparatus, comprising:

[0044] a communication interface configured to receive wireless communication service from a first access point;

[0045] a sensor configured to detect fingerprint data;

[0046] a processor;

[0047] a memory including computer program code;

[0048] the memory and the computer program code configured to, with the processor, cause the apparatus to:

[0049] detect a change in fingerprint data relating to available access points;